

REMARKS

This is intended as a full and complete response to the Office Action dated July 21, 2008, having a shortened statutory period for response set to expire on October 21, 2008. Please reconsider the claims pending in the application for reasons discussed below.

Claims 23-48 remain pending in the application and are shown above. Claims 23-48 are rejected by the Examiner. Reconsideration of the rejected claims is requested for reasons presented below.

Claim Rejections – 35 U.S.C. § 103

Claims 23 and 36 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Cain et al.* (U.S. Patent No. 5,439,524) in view of *Chang et al.* (U.S. Patent No. 6,040,022), *Hamelin et al.* (U.S. Publ. No. 2006/0134919), and *Fukuda* (U.S. Publ. No. 2003/0097987). Applicant respectfully traverses the rejection.

The Examiner asserts that *Cain et al.* teaches a plasma processing apparatus with an RF power source coupled to a diffuser plate having a plurality of gas passages extending from an upstream side to a downstream side. The Examiner admits that *Cain et al.* fails to teach at least one gas passage located in the center of the diffuser plate and hexagonal patterns of gas passages disposed thereabout. The Examiner further asserts that *Chang et al.* teaches an inlet gas manifold with holes arranged in a pattern of overlapping interlocking face centered hexagons. The Examiner admits that *Cain et al.* and *Chang et al.* do not teach a gas passage as recited in claims 23 and 36. The Examiner further asserts that *Hamelin et al.* teaches a distribution plate 430 comprising a plurality of gas passages 446 passing between the upstream and downstream sides, wherein at least one of the gas passages has a first right cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape, a coaxial conical shape 444 connected to the second cylindrical shape for the remaining length of the diffuser plate, with the

upstream end of the conical portion having substantially the same diameter as the second cylindrical shape and the downstream end of the conical portion having a larger diameter. The Examiner further admits that *Cain et al.*, *Chang et al.*, and *Hamelin et al.* do not teach a plasma process chamber coupled to a remote plasma coupled to a fluorine source. The Examiner asserts that *Fukuda* teaches a remote plasma cleaning method in which a cleaning gas (NF₃) is excited to a plasma state and activated inside an external discharge chamber isolated from the reaction chamber. Applicant respectfully submits that the Examiner errs in this assertion.

Cain et al. teaches a plasma processing apparatus having an RF power source coupled to a gas distribution plate with a concave lower surface. The gas distribution plate has a plurality of gas passages extending therethrough. *Cain et al.* does not teach a gas passage having a first cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape and extending for a portion of its length, a coaxial conical shape connected to the second cylindrical shape for the length of the remaining portion of the diffuser plate, with the upstream end of the conical shape having substantially the same diameter as the second cylindrical shape and the downstream end of the conical shape having a larger diameter.

Chang et al. teaches an inlet gas manifold with holes arranged in a pattern of overlapping interlocking face centered hexagons. *Chang et al.* does not teach a gas passage having a first cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape and extending for a portion of its length, a coaxial conical shape connected to the second cylindrical shape for the length of the remaining portion of the diffuser plate, with the upstream end of the conical shape having substantially the same diameter as the second cylindrical shape and the downstream end of the conical shape having a larger diameter.

Hamelin et al. teaches a processing system for chemical oxide removal. The system includes a gas distribution system 420 for distributing a process gas comprising at least two gasses. The gas distribution system 420 includes a first plate 430 coupled to a second plate 432. The coupled plates have a passage 446 formed therethrough. The passage has a first conical shape extending from the upstream side, wherein the upstream side of the first conical shape has a larger diameter than the downstream side. The first conical shape is connected to a first cylindrical shape extending downstream from the smaller diameter of the first conical shape. A second conical shape extends from the downstream side of the first cylindrical shape, wherein the upstream side of the second conical shape has a larger diameter than the downstream side of the second conical shape. A third conical shape extends from the downstream side of the second conical shape. The third conical shape has a diameter larger than the diameter of the downstream side. A second cylindrical shape extends downstream from the third conical shape. The second cylindrical shape has a diameter smaller than the diameter of the first cylindrical shape. A fourth conical shape extends downstream from the second cylindrical shape. The upstream side of the fourth conical shape has a diameter substantially the same as the diameter of the second cylindrical shape. The downstream side of the fourth conical shape has a diameter smaller than the diameter of the upstream side of the fourth conical shape. A third cylindrical shape extends from the downstream side of the fourth conical shape and has a diameter substantially the same as the diameter of the downstream side of the fourth conical shape. A fifth conical shape extends from the third cylindrical shape to the downstream side of the gas distribution system 420.

Hamelin et al. does not teach a gas passage having a first cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape and extending for a portion of its length, a coaxial conical shape connected to the second cylindrical shape for the length of the remaining portion of the diffuser plate, with the upstream end of the conical shape having substantially the same diameter as the second cylindrical shape and the

downstream end of the conical shape having a larger diameter as asserted by the Examiner.

Fukuda teaches a plasma chamber with a remote plasma source coupled to a cleaning gas source. *Fukuda* does not teach a gas passage having a first cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape and extending for a portion of its length, a coaxial conical shape connected to the second cylindrical shape for the length of the remaining portion of the diffuser plate, with the upstream end of the conical shape having substantially the same diameter as the second cylindrical shape and the downstream end of the conical shape having a larger diameter.

Thus, *Cain et al.*, *Chang et al.*, *Hamelin et al.*, and *Fukuda*, alone or in combination, fail to teach, show, or suggest a gas passage having a first cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape and extending for a portion of its length, a coaxial conical shape connected to the second cylindrical shape for the length of the remaining portion of the diffuser plate, with the upstream end of the conical shape having substantially the same diameter as the second cylindrical shape and the downstream end of the conical shape having a larger diameter.

Therefore, *Cain et al.*, *Chang et al.*, *Hamelin et al.*, and *Fukuda*, alone or in combination, fail to teach, show, or suggest a gas distribution plate assembly for a plasma deposition chamber comprising a diffuser plate having an upstream side and a downstream side in the plasma deposition chamber, a plurality of gas passages passing between the upstream and downstream sides, wherein at least one of the gas passages is located in the center of the diffuser plate and hexagonal patterns of gas passages are disposed thereabout, each gas passage has a first cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape and extending for a portion of its length, a

coaxial conical shape connected to the second cylindrical shape for the length of the remaining portion of the diffuser plate, with the upstream end of the conical shape having substantially the same diameter as the second cylindrical shape and the downstream end of the conical shape having a larger diameter, and an RF power source coupled to the diffuser plate as recited in amended claim 23 and claims 24-35 dependent thereon. Applicant respectfully requests withdrawal of the rejection.

Additionally, *Cain et al.*, *Chang et al.*, *Hamelin et al.*, and *Fukuda*, alone or in combination, fail to teach, show, or suggest a gas distribution plate assembly for a plasma deposition chamber comprising a diffuser plate having an upstream side and a downstream side in the plasma deposition chamber that is coupled to a remote plasma source and the remote plasma source is coupled to a fluorine source, a plurality of gas passages passing between the upstream and downstream sides, wherein at least one of the gas passages is located in the center of the diffuser plate and hexagonal patterns of gas passages are disposed thereabout, each gas passage has a first cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape and extending for a portion of its length, a coaxial conical shape connected to the second cylindrical shape for the length of the remaining portion of the diffuser plate, with the upstream end of the conical shape having substantially the same diameter as the second cylindrical shape and the downstream end of the conical shape having a larger diameter, and an RF power source coupled to the diffuser plate as recited in amended claim 36 and claims 37-48 dependent thereon. Applicant requests withdrawal of the rejection.

Claims 24-31, 33, 35, 37-44, 46 and 48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Cain et al.* (U.S. Patent No. 5,439,524) in view of *Chang et al.* (U.S. Patent No. 6,040,022), *Hamelin et al.* (U.S. Publ. No. 2003/0097987) and *Fukuda* (U.S. Publ. No. 2003/0097987) as discussed in claims 23 and 36 above and further in view of *Metzner et al.* (U.S. Patent No. 6,454,860), on grounds that. Applicant respectfully traverses the rejection.

The deficiencies of *Cain et al.*, *Chang et al.*, *Hamelin et al.*, and *Fukuda* are discussed above with respect to base claims 23 and 36. The teachings of *Metzner et al.* do not cure these deficiencies. Applicant respectfully requests withdrawal of the rejection.

Claim 32, 34, 45, and 47 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Cain et al.* (U.S. Patent No. 5,439,524) in view of *Chang et al.* (U.S. Patent No. 6,040,022), *Hamelin et al.* (U.S. Publ. No. 2006/0134919), *Fukuda* (U.S. Publ. No. 2003/0097987) and *Metzner et al.* (U.S. Patent No. 6,454,860) as discussed in claims 24-31, 33, 35, 37-44, 46 and 48 above further in view of *White et al.* (U.S. Publ. No. 2003/0066607).

The deficiencies of *Cain et al.*, *Chang et al.*, *Hamelin et al.*, and *Fukuda* are discussed above with respect to base claims 23 and 36. The teachings of *Metzner et al.* and *White et al.* do not cure these deficiencies. Applicant respectfully requests withdrawal of the rejection.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

Having addressed all issues set out in the Final Office Action, Applicant respectfully submits that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,

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